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EXAMINER

JUBA JR, JOHN

ART UNIT PAPER NUMBER

2872

DATE MAILED: 05/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/071,145

Applicant(s)

VAKOC, BEN

Examiner

John Juba

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-36 is/are rejected.
- 7) ☒ Claim(s) 9 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4,5</u> . | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Information Disclosure Statement

Applicant's I.D.S., filed August 5, 2002 has been fully considered. The first citation on each of sheets 3/4 and sheet 4/4 (both to Madsen, et al) have been lined-through because they lack a publication date and are not proper citations. These references will not be printed on the first page of any patent issuing from the instant application.

Specification

The application is objected to because of alterations which have not been initialed and/or dated as is required by 37 CFR 1.52(c) (Wite-out® at the bottom of Pg. 25).

Any interlineation, erasure, cancellation, or other alteration of the application papers filed must be made before signing of any accompanying oath of declaration pursuant to §1.63. Application papers containing alterations made after the signing of the declaration referring to those application papers must be supported by a supplemental oath of declaration under §1.67. Thereafter, amendments may only be made in the manner provided by §1.121.

A properly executed oath or declaration which complies with 37 CFR 1.67(a) and identifies the application by application number and filing date is required

Claim Objections

Claims 5, 6, 13 – 15, 24 – 26, 29, 30, and 34 are objected to because of the following informalities. Appropriate correction is required:

Claims 5, 6, 13, 14, 29, and 34 should be amended to recite "further wherein (the element) comprises" instead of "the element further comprises", since the corresponding element in the base claim is identified only by name and function. That is, the examiner believes that these claims *further limit* the structure, rather than provide further structure. Claim 15 is objected to as inheriting the same deficiency through its dependency from claim 14.

In claim 24, the phrase "and the second polarized light signal propagates through the wavelength-dependant delay path in a second direction substantially opposite the first direction" is not in the proper syntax. In the context of § 112, sixth paragraph, this limitation currently takes the form of a "wherein clause" so as to be apart from the recited "function". Claims 25 and 26 inherit the same syntactic error through their dependency from claim 24.

In claim 30, "the cavity" lacks antecedent basis.

Claim Rejections - 35 USC § 112

Claims 12 and 33 – 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 12 is confusing or incomplete in the recitation of "the wavelength delay path to produce a distortion". That is, it is not clear whether there is text missing, such as "the wavelength delay path *is varied* to produce a distortion", or whether this claim simply requires that the wavelength delay path *produces/is for producing* distortion.

Claim 33 is confusing as to whether the recitation of "a second polarization rotator" is a reiteration of the "second polarization rotator" recited in claim 32, or whether the recitation is directed to a third polarization rotator. Claims 34 and 35 inherit the same deficiency through their dependency from claim 33.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 4, 6, 17, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by LASERCOMM, INC. (WO 99/49342 A1; identified in Applicant's I.D.S. as "Danziger"). Referring to Figure 19 and the associated text, LASERCOMM INC. disclose an apparatus comprising a dispersion compensation module including a beam spatial orientation device (172), a wavelength-dependent delay path (180) coupled to the beam spatial orientation device via mode transformers (178), and a polarization rotator (174) coupled to the wavelength-dependent delay path such that a first polarized light signal reflects into the wavelength-dependent delay path in substantially

the opposite direction from which a second polarized light signal transmits into the delay path.

With regard to claims 3, 4, and 6, the spatial separating device is a polarization beam splitting prism. As such, the examiner believes that one of ordinary skill would "at once envisage" a polarizing beam splitter that reflects "S" polarized light. Thus, it is believed that LASERCOMM, INC fairly disclose the first polarized light signal (reflected into the delay means) as being of "S" ("TE") polarization. However, if such is not the case, then the first polarization is of "P" polarization, and LASERCOMM, INC disclose the first polarized signal as a "TM" wave.

With regard to claim 24, the claims include "means-plus-function" recitations. It is clear from the "three-prong analysis" (Federal Register/Vol. 65, No. 120, pp. 38510 - 38516; June 21, 2000) that the claims indeed invoke 35 USC §112, sixth paragraph. As there is no express *definition* of the means associated with each of the functions recited, the associated structure then turns on what one of ordinary skill would identify as the structure for performing the recited function. In the instant case, one of ordinary skill would recognize that the function "separating an optical signal . . ." clearly corresponds (in one embodiment) to a polarizing beam splitter (e.g., "524" in Fig. 5). The examiner finds that the polarizing beam splitter (172) of LASERCOMM, INC performs the same function, in substantially the same way, and produces substantially the same results with the specificity recited. Similarly, the examiner believes that one of ordinary skill would recognize the function "routing the first polarized light signal through a wavelength-dependant delay path in a first direction" as corresponding to a succession

of quarter-wave plates that also permits coupling of the signal out of the delay path with the proper polarization orientation. The recited "means for routing" are regarded as separate from the delay path itself. The examiner finds that the prior art quarter-wave plates (174) perform the same function, in substantially the same way, and produce substantially the same results with the specificity recited. Thus, the beam splitter and quarter-wave plates of LASERCOMM, INC are *prima facie* functional equivalents of the claimed means. See also *Micro Chem., Inc. V. Great Plains Chem. Co., Inc.*, 194 F.3d 1250, 52 USPQ.2d 1258 (Fed. Cir. 1999):

In construing claims drafted in § 112, ¶ 6 form, "[t]he statute does not permit limitation of a means-plus-function claim by adopting a function different from that explicitly recited in the claim. Nor does the statute permit incorporation of structure from the written description beyond that necessary to perform the claimed function."

Claims 1 - 8, 11, 14 - 19, 24, 25, and 32 - 35 are rejected under 35 U.S.C. 102(e) as being anticipated by Colbourne, et al (U.S. Patent Application Pub. 2001/00210534 A1). Referring *for example* to Figure 10 and the associated text, Colbourne, et al disclose an apparatus comprising a dispersion compensation module including a beam spatial orientation device (PBS), a wavelength-dependent delay path (109) coupled to the beam spatial orientation device, and a polarization rotator (QWP/mirror) coupled to the wavelength-dependent delay path such that a first polarized light signal reflects into the wavelength-dependent delay path in substantially the opposite direction from which a second polarized light signal transmits into the delay path. That is, the examiner regards the "first" polarized light signal as being the "e-

polarized" light (354) reflected into to the wavelength-dependent delay device by mirror (352) after the forward pass through the system, this beam being separated from light of the "second" polarization, which the examiner regards as the "o-polarized light" traveling in the forward direction through the system.

With regard to claims 2 and 16, Colbourne, et al disclose a first "paralleling" device (340), which is disclosed as comprising a collimator.

With regard to claims 3 and 4, the examiner believes the beam splitters of Colbourne, et al have the nature of passing "p-polarized" light and reflecting "s-polarized" light. That is, the "first polarized" light ("o-polarized") is actually "p-polarized" with respect to the beam splitting film. Thus, the E-field is parallel to the plane of reflection, and the "first" polarized light is TM polarized light. However, if such is not the case, then the "first" polarized light must be TE polarized.

With regard to claim 5, reference should be had to the embodiment of Figure 8, wherein the spatial separator comprises a walk-off crystal. light exiting the stacked cavities and quarter-wave plate comprises a forward-passing "e-polarized" beam and a return-pass traveling "o-polarized" beam, which beams are separated by the spatial separator yBD.

With regard to claims 6 – 8, and 11, Colbourne, et al disclose use of a temperature control element ("heater") as the sole means of tuning the series of cavities (paras. [0078] & [0083]). It will be appreciated that such tuning *inherently* changes the center wavelength.

With regard to claims 14 and 15, the apparatus further includes a quarter-wave plate (QWP) coupled to the cavity.

With regard to method claims 17 – 19, there is nothing in the claims requiring the step of separating to be the first step. In any event, upon return of light from the cavities, the separating films separate forward-pass “e-polarized” light from return-pass “o-polarized” light. Upon reflection by the QWP/mirror combination, the films separate return-pass light in the “e-polarized” state from the forward-pass light in the “o-polarized” state. The steps of collimating and temperature adjusting are disclosed, as discussed above for claims 2 and 6.

With regard to claims 24 and 25, the examiner regards spatial separating means, routing means, and collimating means to be functionally equivalent to the means disclosed, because they accomplish the same result *within the specificity of the result recited*, in substantially the same way.

With regard to claims 32, 33, and 35, Colbourne, et al disclose a non-illustrated embodiment (para. [0082]) wherein the apparatus is arranged with the first and second resonator stacks and first and second rotators of Figure 6 and the single spatial separator yBD of Figure 6 is replaced with the multiple separators of Figure 7. In accordance with the teachings of Colbourne, et al, the resonator stacks are each temperature-controlled for tuning.

With particular regard to claim 34, Colbourne, et al teach the inclusion of a 45° Faraday rotator coupled to a half-wave plate (garnet half-wave plate block, 332), which may be regarded as a further part of the first rotator.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 12, 20 – 23, and 26 – 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne, et al (U.S. Patent Application Pub. 2001/00210534 A1), in view of Official notice. As set forth above with respect to claims 1, 7, and 24, Colbourne, et al disclose the invention substantially as claimed. However, with regard to claims 12, 20 – 23, and 26, Colbourne, et al do not expressly disclose a Q-penalty less than 1-dB, as recited.

In connection with Figure 4, Colbourne, et al teach that the cavity characteristics can be selected to correct for dispersion in an optical fiber over a broad range of wavelengths. One of ordinary skill would understand this to mean that the dispersion accrued by transmission through the fiber can be compensated by the dispersion compensator, such that the net dispersion is zero.

It would have been obvious to one of ordinary skill to configure the cavities of Colbourne, et al to exactly cancel the dispersion accumulated by transmission through an optical fiber in the interest of achieving a net zero dispersion, as suggested by Colbourne, et al. The examiner believes that an optical channel corrected in this manner would exhibit a Q-penalty less than 1 dB, as recited.

With regard to claims 27 – 30, Colbourne, et al disclose the invention substantially as claimed, and further disclose that the input arrangement of Figure 10 (xBD)(336)(yBD) garnet/HWP effectively constitutes a “circulator”. However, Colbourne, et al do not illustrate a receiver or a transmitter.

Colbourne, et al do disclose that the dispersion compensating arrangement is for use in wavelength division multiplexed optical communications systems. The examiner takes Official notice of the fact that it was well-known in wavelength division multiplexed optical communications systems to connect a transmitter and a receiver to a dispersion compensator, in the interest of providing a source of the signal to be compensated and a means of detecting the compensated signal for distortion analysis or further data processing.

It would have been obvious to one of ordinary skill to connect a transmitter and receiver to the dispersion compensator of Colbourne, et al in the interest of providing a signal for compensation and detecting the signal for analysis or further data processing as was well known. One of ordinary skill would have appreciated that a dispersion compensator that is not ultimately connected to each of these components lacks any utility.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne, et al (U.S. Patent Application Pub. 2001/00210534 A1), in view of Cheng, et al. As set forth above for claim 1, Colbourne, et al disclose the invention substantially

as claimed. However, Colbourne, et al disclose the polarization rotator as comprising a quarter-wave plate and a mirror, but do not disclose the polarization rotator as comprising a Faraday rotating mirror.

In the same field of endeavor, Cheng, et al disclose an optical filter in which light traverses the filter in opposite directions and with mutually orthogonal polarization states. For the purpose of reflecting light with a state of polarization orthogonal to its original state, Cheng, et al teach that a Faraday rotating mirror is equivalent to a quarter-wave plate/ mirror combination (Fig. 3 *vis à vis* Fig. 1).

It would have been obvious to one of ordinary skill to employ a Faraday rotating mirror in place of the quarter-wave/plate mirror combination of Colbourne, et al, since the two were art-recognized equivalents for the purpose, as taught by Cheng, et al. In the instant case, one would have been motivated to make the substitution in order to gain the benefit of the substantially wavelength-independent rotation imparted by the Faraday element, as compared to the wave plate.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne, et al (U.S. Patent Application Pub. 2001/00210534 A1) and Official notice, and further in view of Cheng, et al. As set forth above for claim 27, Colbourne, et al disclose the invention substantially as claimed, and in light of Official notice, it is believed that the further provision of a transmitter and receiver in combination with the dispersion compensator would have been obvious. However, Colbourne, et al teach the

use of a quarter-wave plate for rotating the polarization state as it enters and exits the cavities. That is, Colbourne, et al do not disclose a 45° Faraday rotator at the cavities, as recited.

In the same field of endeavor, Cheng, et al disclose an optical filter in which light traverses the filter in opposite directions and with mutually orthogonal polarization states. For the purpose of reflecting light with a state of polarization orthogonal to its original state, Cheng, et al teach that a Faraday rotating mirror is equivalent to a quarter-wave plate/ mirror combination (Fig. 3 *vis à vis* Fig. 1).

It would have been obvious to one of ordinary skill to employ a Faraday rotator in place of the quarter-wave Colbourne, et al, since the two were art-recognized equivalents for the purpose of rotating a polarization state upon reflection, as taught by Cheng, et al. In the instant case, one would have been motivated to make the substitution in order to gain the benefit of the substantially wavelength-independent rotation imparted by the Faraday element, as compared to the wave plate.

Claims 10 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbourne, et al (U.S. Patent Application Pub. 2001/00210534 A1), in view of Liu, et al (U.S. Patent number 6,396,632). As set forth above for claims 1 and 20, Colbourne, et al disclose the invention substantially as claimed, and fairly suggest tuning for a Q-penalty less than 1 dB. However, Colbourne, et al disclose Gires-

Tournois cavities rather than multilayer dielectric filters, and disclose temperature tuning of the cavities rather than stress-tuning of the cavities.

In the same field of endeavor, Liu, et al disclose cavity filters for wavelength division multiplexed communications systems. Liu, et al teach that cavity filters used for such filters can have reflectors which comprise a series of dielectric layer thicknesses selected to achieve a particular characteristic. Liu, et al teach that hundreds of such layers can be used. One of ordinary skill would recognize this as teaching of the dielectric layers as not exhibiting the absorption losses associated with metallic reflectors. Liu, et al further teach that such cavity filters can be tuned by application of mechanical stress, and teach that this tuning method is very fast.

With regard to claim 10, it would have been obvious to one of ordinary skill to employ multiple dielectric layers for the cavity reflectors of Colbourne, et al, in the interest of tailoring the reflection characteristics without the losses associated with metallic reflectors, as fairly suggested by Liu, et al.

With regard to claim 36, it would have been obvious to one of ordinary skill to employ the stress tuning arrangement of Liu, et al in place of the temperature tuning method of Colbourne, et al, in the interest of achieving fast tuning, as suggested by Liu, et al. One of ordinary skill would have appreciated that the stress tuning method would have been free of any delay associated with the thermal capacity of the filter assembly.

Claims 20 – 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madsen, et al (*IEEE Photon. Lett.* 12(6)). Referring to the four stage example (beginning with the last line on Pg. 652), Madsen, et al disclose a method in which variation (“ripple”) in chromatic dispersion across a pass-band of wavelengths produces a distortion of an optical signal propagated through a plurality of resonator cavities, wherein the distortion incurs [results in] a Q-penalty of less than one decibel. Thus, Madsen, et al disclose the invention substantially as claimed. However, despite the fact that the optical thicknesses of the cavities are tunable by changing the temperature in the series of resonators, it appears that the experiment was conducted at a single design dispersion of -100 ps/nm. That is, it is not clear that thickness tuning was actually performed in the one simulation.

Madsen, et al suggest that their dispersion compensator is suitable for use with nonlinear systems having launch power variations, and that in such cases it will be necessary to vary the dispersion. Madsen, et al teach this is accomplished by varying both the cavity thicknesses and reflectivities (last sentence, Pg. 651; third whole paragraph, Pg. 652).

It would have been obvious to one of ordinary skill to vary at least one cavity thickness in the series of cavities of Madsen, et al, in the interest of compensating for dispersion in nonlinear systems exhibiting launch power variations, as suggested by Madsen, et al.

With regard to claim 21, it will be appreciated that the distortion introduced by variations in dispersion across the pass band will be manifested or at least capable of characterization in terms of deviation from the mean value over the pass band.

With regard to claim 22, changing the optical thickness of a cavity inherently changes the center wavelength of the cavity.

Allowable Subject Matter

Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

The prior art, taken alone or in combination, fails to teach or to fairly suggest a fiber Bragg grating as a wavelength dependent delay path *in combination with a beam spatial orientation device and rotator cooperating as recited.*

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yeh, et al (U.S. Patent Appl. Pub. 2003/0053214 A1) disclose a multi-cavity dispersion compensator.

Liu, et al (U.S. Patent Appl. Pub. 2003/0020989 A1) disclose a gain equalizer with several geometries for spatially separating a light signal and passing signals of

mutually orthogonal polarization states in substantially opposite directions through the gain equalizer.

Li, et al (U.S. Patent number 6,522,467) disclose a spatial separator and polarization rotators arranged so an optical signal passes in two directions through a tunable cavity.

Riant, et al discuss the polarization dependent loss attendant fiber Bragg gratings due to birefringence in Ge-doped host fibers.

Moeller discloses a dispersion compensating apparatus comprising a wavelength-dependent delay path, a polarizing beam splitter, and a polarization rotating reflector, wherein the reflector may comprise a mirror, a dielectric mirror, or a fiber Bragg grating (linear or chirped), and further wherein the signal having a first polarization state passes through the wavelength-dependent delay path in a first direction, and passes the path in second direction with its polarization rotated by 90°.

Galvanauskas, et al disclose a fiber Bragg grating arranged with polarizing beam splitters and polarization rotators so that the signal having a first polarization passes through the grating in one direction and passes through the grating in the opposite direction with an orthogonal polarization.


Cheng, et al disclose a Faraday rotator/mirror combination for directing light through an interference filter in one direction with its state of polarization orthogonal to the state in which it passed through the filter in the opposite direction.

Robertson, et al disclose a filter arrangement wherein a signal passes through an etalon in two directions with its polarization states mutually orthogonal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on Mon.- Thu., 9 - 5. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

April 18, 2003